

Three new species in *Lindernia* All. s.l. (Linderniaceae) for Australia

B.S. Wannan

Summary

Wannan, B.S. (2016). Three new species in *Lindernia* All. s.l. (Linderniaceae) for Australia. *Austrobaileya* 9(4): 508–523. Three new species from the genus *Lindernia* are described: *L. stantonii* Wannan, *L. beasleyi* Wannan from northern Queensland (Cape York Peninsula), and *L. barkeri* Wannan from northern Western Australia (Kimberley). Illustrations of flowers, fruits, seeds, leaves, stem anatomy, type specimen and a distribution map are provided for all species. Notes on habitat and conservation status are also provided for each. A key to Queensland species is provided.

Key Words: Linderniaceae, *Lindernia*, *Lindernia barkeri*, *Lindernia beasleyi*, *Lindernia stantonii*, Australia flora, Queensland flora, Western Australia flora, wetland plants, new species, taxonomy, identification key, seed morphology, stem anatomy

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Introduction

The genus *Lindernia* All. (Linderniaceae Borsch, K.Müll. & Eb.Fisch.) is a pan-tropical genus represented in Australia by approximately 50 species. *Lindernia* species have been collected and described in Australia for over 200 years in regional floras (Stanley & Ross 1986; Barker 1992a; Cowie *et al.* 2000), state floras (Bailey 1901; Ewart & Davies 1917; Barker 1992b) and national floras (Brown 1810; Bentham 1868). Australian *Lindernia* species have also been described in a Malesian revision (Philcox 1968) and a recent revision of the subgenus *Bonnaya* (Liang & Wang 2014). Species continue to be discovered and added to the Australian flora by descriptions of new taxa (Barker 1990, 1998) and by identification of previously unrecognised taxa (Wannan 2013). In spite of this work, many species are yet to be formally named, especially those from the Northern Territory and no overall account of the Australian species is available.

The current paper describes three new species for Australia: two from Cape York Peninsula (northern Queensland) and one from the Kimberley (northern Western

Australia). The Kimberley species was treated as *Lindernia* sp. A by Barker (1992a). The new species are described under the genus *Lindernia* as the generic boundaries proposed by Fischer *et al.* (2013) are not well supported by molecular studies of Australian species (Wannan *et al.* unpubl.).

Materials and methods

The species descriptions are based on herbarium specimens (BM, BRI, CANB, CNS, DNA, MEL, PERTH, UNSW), spirit material (BRI and the author's own collections), and examination of fresh material collected by the author. Length by width measurements in mm are indicated as length × width mm. Images of seeds are provided from scanning electron microscopy (SEM) at the Australian Museum, Sydney. Images from stem anatomy were obtained from freehand sections by the author and stained with Toluidine blue. An abbreviation used in the specimen citations is NP for National Park.

Taxonomy

A key to formally described Queensland species is provided below. A key to Western Australian *Lindernia* is provided in Barker (1992a).

Key to Queensland *Lindernia* species

- 1 Capsule > 2× length of calyx, cylindrical or fusiform 2
1. Capsule < 2× length of calyx, globose or ovoid 5
- 2 Flowers axillary, 1 per axil (i.e. no differentiation between leaves & floral bracts) 3
2. Flowers in a loose raceme (i.e. floral bracts much smaller than leaves) 4
- 3 Upper stamens only, anthers without tails, leaf length < 3× breadth,
pedicel 5–11 mm **L. antipoda**
3. Upper & lower stamens, anthers with tails, leaf length > 3× breadth,
pedicel 15–20 mm **L. anagallis**
- 4 Leaves crenate with aristate margins, calyx 4.5–6 mm, corolla
white with purple spots **L. ciliata**
4. Leaves crenate without aristate margins, calyx 3–3.5 mm, corolla pink. **L. tenuifolia**
- 5 Fertile upper stamens only 6
5. Fertile upper & lower stamens 7
- 6 Leaves with 3–5 longitudinal veins, corolla 5–6.5 mm long, no internal
flaps in corolla. **L. hyssopioides**
6. Leaves with midvein only, corolla 10–13 mm long, stamens enclosed by
flaps in corolla. **L. tectanthera**
- 7 Leaves ovate with 3–5 longitudinal veins, 8
7. Leaves subulate with a single midrib or no visible midrib, 10
- 8 Leaves, pedicel and calyx with filamentous eglandular trichomes. 9
8. Leaves, pedicel and calyx without filamentous eglandular trichomes
(sometimes with stalked-glandular or sessile-glandular trichomes) **L. alsinoides**
- 9 Calyx lobed to base at anthesis, 1–3 flowers per axil **L. pusilla**
9. Calyx fused for greater than ¼ of length at anthesis, 1 flower per axil **L. crustacea**
- 10 Erect herbs with terminal cluster of flowers, pedicels < 10 mm long 11
10. Decumbent herbs with flowers in axils, pedicels > 10 mm long 12
- 11 Corolla < 7 mm long, with no staminal appendages **L. aplectra**
11. Corolla > 9 mm long, with appendages on lower stamens. **L. stantonii**
- 12 Corolla with spotted lower lobes, ovary without stalked-glandular
trichomes, pedicels 31–63 mm with stalked-glandular trichomes, calyx
2.5–4 mm long **L. beasleyi**
12. Corolla without spotted lower lobes, ovary with stalked-glandular
trichomes, pedicels 20–43 mm without stalked-glandular trichomes,
calyx 4–5 mm long **L. subulata**

***Lindernia stantonii* Wannan sp. nov.**
Similar to *L. aplectra* W.R.Barker but differs in its possession of appendages on its lower stamens (versus appendages absent), presence of stalked glandular trichomes on the ovary (versus absent), longer pedicels (2–7 mm versus 1–3 mm), longer corolla (9–15 mm versus 5–7 mm), shorter leaves (0.5–2.5 mm versus up to 12 mm), seed size (c. 0.35

× 0.2 mm versus c. 0.6 × 0.35 mm) and seed ornamentation (absence of regular fence-like pattern versus presence). **Typus:** Queensland. COOK DISTRICT: Road to Pormpuraaw, 12 June 2008, *B.S. Wannan 5243* & *P. Graham* (holo: BRI; iso: CNS).

Lindernia sp. Hann River (J.R. Clarkson 7953); Fechner (2007: 188, 2014: 24).

Annual herb; stems erect, scape-like, rigid, 10–35 cm high, glabrous, green or sometimes red-purple. **Leaves** cauline, opposite, simple, subsessile, triangular and scale-like, 0.5–2.5 mm \times 0.2–0.5 mm, glabrous; margins entire; single midvein obscure. **Flowers** crowded at the apex of stems, subtended by leaves that occasionally have stalked glandular trichomes; pedicels ascendent, 2–7 mm long with stalked glandular trichomes. **Calyx** divided to base, lobes triangular-lanceolate, 2.5–3(–4) \times c. 0.5 mm, green, with stalked glandular trichomes, 3-nerved. **Corolla** 9–15 mm long; white, cream or mauve or yellow, with stalked glandular trichomes outside, internal flaps absent; tube 4–9 mm long, upper lobe porrect, emarginate, 2–2.5 mm long; lower lip 3-lobed, 4–6 mm long, reflexed downwards. **Upper stamens** 2 fertile, each with 2 cells; filaments 1–2 mm long; anthers cohering with cells 0.5–0.8 mm long, apiculate. **Lower stamens** 2 fertile, each with 2 cells; filaments 3–6 mm long; anthers cohering with cells 0.3–0.8 mm long, apiculate, one of each pair smaller. Staminal appendage simple, 0.5–0.8 mm long, included within the throat and with bullate trichomes. **Ovary** 1–1.5 mm long, with stalked glandular trichomes in upper half; nectariferous disc undulate around base of ovary; style 6–10 mm long, with sparse stalked glandular trichomes. **Fruit** with erect pedicels 5–7 mm long, with stalked glandular trichomes; calyx 3–4 mm long; capsule globular, 3–3.5 mm long, with stalked glandular trichomes at apex. **Seeds** rhomboidal, c. 0.35 \times 0.2 mm, surface with 4 ridges in transverse section, sulcate, light brown. **Stem anatomy** in transverse section circular with four collenchyma bundles and secondary thickening in vascular cambium; few air spaces in outer cortex. **Figs. 1–8.**

Additional selected specimens examined: **Queensland.** COOK DISTRICT: Moa, Torres Strait, 3 km NNE of Kubin, May 2003, *Wannan 3090 & Toh* (BRI, NSW); Coen, Aug 1976, *Scarth-Johnson 309A* (BRI); 18 km SW of Silver Plains Homestead, Aug 1978, *Paijmans 2934* (BRI, CANB); Silver Plains, Jun 2013, *McDonald KRM14339* (CNS); Lama Lama NP, Princess Charlotte Bay, Jul 2010, *Thompson SLT1036* (BRI); Lama Lama NP, Princess Charlotte Bay, Jun 2012, *McDonald KRM13178 & Thompson* (BRI); Lama Lama NP, Princess Charlotte Bay, Jun 2012, *McDonald KRM13179 & Thompson*



Fig. 1. *Lindernia stantonii*. Plants with white flowers – arrows indicate minute leaves, c. $\times 2$ (*Wannan 3090 & Toh*, BRI). Photo: B.S. Wannan.

(CNS); 6 km N of Lilyvale on track to Running Creek, Jun 1993, *Clarkson 10094 & Neldner* (BRI, CNS); 7 km NE of Musgrave on road to Marina Plains, Jul 2000, *Wannan 1864 & Wannan* (BRI, NSW); SE of Musgrave, beside the Peninsula Developmental Road., Jun 2006, *Wannan 4518 & Graham* (BRI); Road to Pormpuraaw,

Jun 2008, *Wannan 5243 & Graham* (BRI); 20 miles [33.3 km] ENE of Musgrave Telegraph Office, Jun 1968, *Pedley 2654* (BRI); Peninsula Developmental Road, 44 miles [7.3 km] beyond Laura, Jul 1965, *Gittins 978* (BRI, CANB, NSW); 7.9 km S of Musgrave on road to Laura, Jul 1998, *Bean 13559* (BRI, MEL); 3.5 km S of the Hann River on the Peninsula Development Road, May 1989, *Clarkson 7953* (BRI, CNS); 9.7 km N of Morehead River, Jun 1989, *Clarkson 8078 & Neldner* (BRI, CNS); Rinyirru NP, 7.4 km along S boundary from Koolburra gate, Aug 2012, *McDonald KRM13417* (BRI); Lama Lama NP, Jun 2013, *McDonald KRM14459* (CNS); Lakefield NP, 35 km along Marina Plains Road from Musgrave, Jun 2011, *McDonald KRM11674* (BRI); 14 km NE of New Laura Ranger Station, Lakefield NP, May 1992, *Neldner 4023* (BRI, CNS); 25 km SE of Lakefield Ranger base, Aug 2014, *Thompson SLT14277 & Fell* (BRI); 44 km SE of Lakefield Ranger base, Aug 2014, *Thompson SLT14346a, SLT14354 & Fell* (BRI); 42 km WNW of 'Bulimba' Homestead in Staaten River NP, Apr 2004, *Fox IDF3110 & Wilson* (BRI); Staaten River NP, Jul 2004, *Williams 1652* (BRI); Staaten River NP, Jul 2004, *Williams 1654 et al.* (BRI); E of Miranda Downs Homestead, July 2001, *Thompson NOR135* (BRI).

Distribution and habitat: *Lindernia stantonii* is endemic to Queensland and occurs from south-west Cape York Peninsula to Torres Strait (**Map 1**). It grows in moist sandy areas in woodland.

Notes: The novelty of this taxon is corroborated by sequence data (Wannan *et al.* unpubl.). It is similar to *Lindernia aplectra* that occurs over much the same distribution range in Queensland, but differs in numerous characters given above. The Torres Strait specimen (*Wannan 3090 & Toh*) is disjunct from the remaining specimens, but its characters fall within the range of the southern elements including lighter flower colour which is typical of other specimens (e.g. *Wannan 1864*, *McDonald KRM11674*, *Thompson SLT14534*). Corolla colour varies throughout the range of this species.

Conservation status: *Lindernia stantonii* has a broad range but remains infrequently collected. A status of **Least Concern** is recommended (IUCN 2001).

Etymology: The species is named for Peter Stanton who has been a leader in conservation on Cape York Peninsula for over 40 years.



Fig. 2. *Lindernia stantonii*. Lateral view of mauve flower, c. $\times 6$ (*Wannan 5243 & Graham*, BRI). Photo: B.S. Wannan.



Fig. 3. *Lindernia stantonii*. Adaxial view of mauve flower, c. $\times 5$ (*Wannan 5243 & Graham*, BRI). Photo: B.S. Wannan.

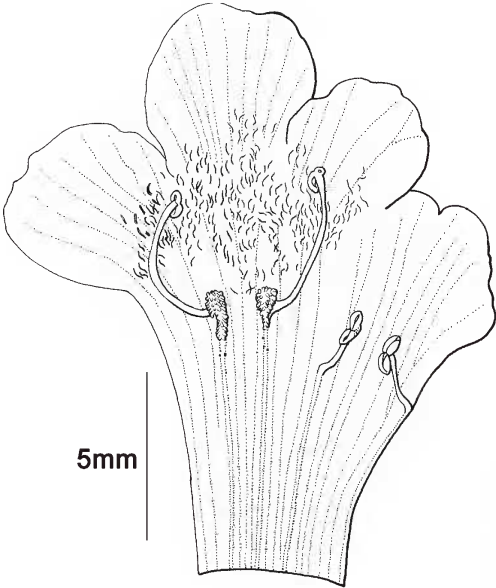


Fig. 4. *Lindernia stantonii*. Corolla opened to show stamens (Wannan 5243 & Graham, BRI). Del. W. Smith.



Fig. 5. *Lindernia stantonii*. Capsule, c. $\times 6.5$ (Wannan 5243 & Graham, BRI). Photo: B. S. Wannan.

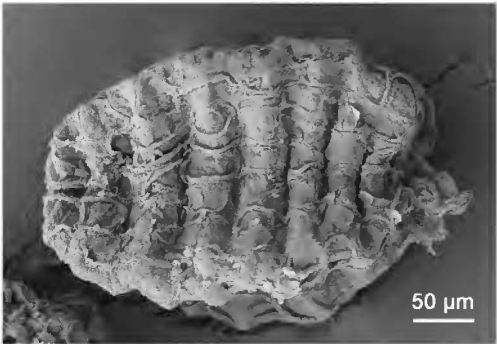


Fig. 6. *Lindernia stantonii*. SEM of seed (Wannan 5243 & Graham, BRI). Photo: Australian Museum.

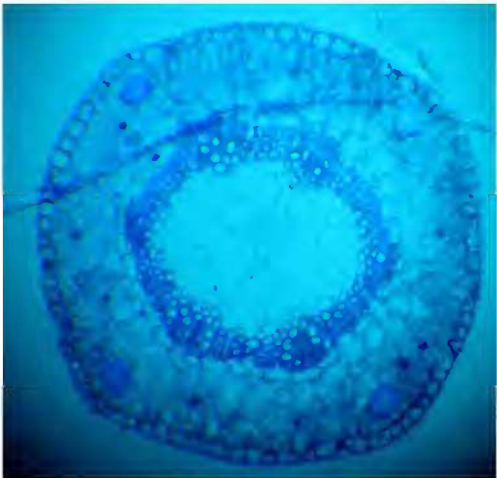


Fig. 7. *Lindernia stantonii*. Transverse stem section, c. $\times 50$ (Wannan 5243 & Graham, BRI). Photo: B.S. Wannan.



Fig. 8. Holotype of *Lindernia stantonii* (Wannan 5243 & Graham, BRI). Photo: W. Smith.

***Lindernia beasleyi* Wannan sp. nov.** Similar to some forms of *L. subulata* R.Br., but differs in having spotted lower corolla lobes, shorter leaves (3–12 mm versus 4–20 mm in *L. subulata*), longer pedicels (31–63 mm versus 20–43 mm), presence of stalked glandular trichomes on pedicels (versus absent), and absence of stalked glandular trichomes from the ovary and fruit (versus present). **Typus:** Queensland. COOK DISTRICT: Merapah, 4 August 2010, *B.S. Wannan 5935* (holo: BRI; iso: CNS, NSW).

Annual herb; stems decumbent and with weakly ascending floral axes, glabrous. **Leaves** cauline, opposite, simple, 3–12 × 0.5–1.5 mm, triangular to subulate, glabrous; margins entire; single midvein often obscure; petiole absent. **Flowers** axillary, shoots sometimes terminated by a cluster of leaves and flowers; pedicels 31–63 mm long (at anthesis), ascending and with stalked glandular trichomes. **Calyx** divided to base, lobes triangular-lanceolate, 2.5–4 mm long, green, with stalked glandular trichomes, three nerved (lateral nerves often obscure). **Corolla** 11–13 mm long, purple and white, with distinctive purple spots on lower lobes; with stalked glandular trichomes externally, internal flaps absent; tube 5–7.5 mm long, upper lobe porrect, emarginate, 2.5–3 mm long, lower lip 3-lobed, 4.5–6.5 mm long, reflexed downwards. **Upper stamens** 2, each with 2 cells; filaments 1.5 mm long, anthers cohering with cells *c.* 0.5 mm long. **Lower stamens** 2, each with 2 cells; filaments 3–5 mm long; anthers cohering with cells 0.4–0.5 mm long, one of each pair smaller, both apiculate. Staminal appendage simple, 2.5–4 mm long, exceeding the throat, with bullate trichomes. **Ovary** 1–1.5 mm long, glabrous; nectariferous disc smooth around base of ovary; style 5–6.5 mm long, glabrous. **Fruit** with erect pedicels 32–73 mm long; calyx 3–4 mm long; capsule ovoid 2.5–4 mm long, glabrous. **Seeds** rhomboidal with longitudinal ridges, *c.* 0.3 × 0.2 mm, surface sulcate, brown. **Stem anatomy** in transverse section four-angled with collenchyma bundles in each corner, with separated vascular bundles; air spaces frequent in outer cortex. **Figs. 9–16.**



Fig. 9. *Lindernia beasleyi*. Lateral view of flower, *c.* ×2.5 (*Wannan 4845 & Graham*, BRI). Photo: B.S. Wannan.



Fig. 10. *Lindernia beasleyi*. Front view of flower, *c.* ×3 (*Wannan 5896 & Spena*, BRI). Photo: B.S. Wannan.

Additional selected specimens examined: Queensland. COOK DISTRICT: 2 km NE of Bamaga Airstrip, Aug 1978, *Paijmans 3012* (BRI); Between Bamaga and tip of Cape York, Sep 1980, *Scarth-Johnson 1041A* (BRI); Lake Wicheura, Cape York, Dec 2008, *Booth 5258 & Lynch* (BRI); Cape York N of Jardine River about 26 km S of Bamaga, Oct 1971, *Dodson s.n.* (BRI [AQ3598]); Cape York, *s.dat.* *Hartmann s.n.* (MEL 285765); Jardine River, May 1948, *Brass 18884* (BRI); Biffen Swamp *c.* 1.5 km S of Mutee Heads Turnoff on road from Bamaga to Jardine River, Aug 1985, *Clarkson 6190* (BRI, CNS); Lake Boronto, Newcastle Bay, Sep 1974, *Webb 13611 & Tracey* (BRI); Near Jacky Jacky Creek, May 1962, *Webb 6011 & Tracey* (BRI); Cape York Peninsula *c.* 50 miles [83 km] S of Cape York, 1943, *Whitehouse s.n.* (BRI [AQ36297]); Sanamere Lagoon *c.* 3 km N of Jardine River Crossing on the road to Bamaga, Aug 1985, *Clarkson 6174* (BRI, CNS); *c.* 2 km S of Ussher Point, Sep 1985, *Clarkson 6247* (BRI, CNS); Fruit Bat Falls, Mar 1992, *Johnson 5067* (BRI); SW of Somerset, Lake Bronto, Aug 1978, *Kanis 2068* (BRI); E of Vrilya

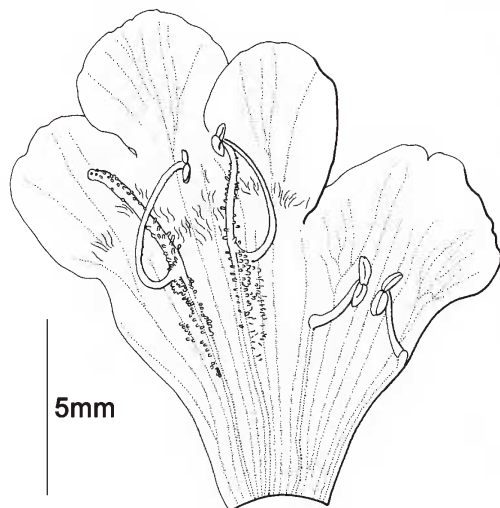


Fig. 11. *Lindernia beasleyi*. Corolla opened to show stamens (Wannan 5935, BRI). Del. W. Smith.



Fig. 12. *Lindernia beasleyi*. Leaf, 4-angled stem and base of pedicel, *c.* $\times 7$ (Wannan 5896 & Spena, BRI). Photo: B.S. Wannan.

Point, Aug 1981, *Morton AM1404* & *Godwin* (CNS); Heathlands, Oct 2004, *Fensham 5125* & *Jensen* (BRI); Bertie Creek, Sept 1989, *Jobson 786* & *Power* (MEL); Bertie Creek, Peninsula Developmental Road, May 1980, *Morton AM920* (CNS); 58 miles [96.6 km] by road N of Moreton towards Jardine River, Aug 1973, *Brooker 4085* (BRI); Orchid Swamp, 2.6 km by road from Coolibah Ranger Station, Steve Irwin Wildlife Reserve, Jun 2011, *McDonald KRM11520* & *Lyon* (BRI); *c.* 8 km S of White Point on southern End of Shelburne Bay, Oct 1991, *Clarkson 9147* & *Neldner* (BRI); 1 km NE of Middle Peak, Shelburne Bay Area, Jun 2008, *Forster PIF33715* & *McDonald* (BRI); Namaleta Creek, E Arm upstream of Venture Mine Lease, Oct 1994, *Gunness AG2403* (BRI); Namaleta Creek, E Arm Drainage Basin



Fig. 13. *Lindernia beasleyi*. Capsules, *c.* $\times 7$ (Wannan 5944 & Beasley, BRI). Photo: B.S. Wannan.



Fig. 14. *Lindernia beasleyi*. SEM of seed (Wannan 5896 & Spena, BRI). Photo: Australian Museum.

upstream of Venture Mine Lease, Oct 1994, *Gunness AG2391* (BRI); *c.* 2.5 km W of Crossing on Glennie Creek on track from Bromley to Bolt Head, Jul 1990, *Clarkson 8760* & *Neldner* (BRI); Frenchmans Track between Wenlock & Pascoe Rivers, Sep 2007, *Wannan 4845* & *Graham* (BRI); *c.* 50 km NE of Weipa, Jul 2010, *Mitchell 190* (BRI); 'Batavia Downs', 4 km W by road of 'Bromley' Homestead, Cape York Peninsula, Jun 2007, *Forster PIF32613* & *McDonald* (BRI); 13.5 km ENE of Weipa Mission, Jul 1974, *Specht W417* & *Salt* (BRI); N of Mt Tozer, Cape York Peninsula, Jul 2004, *Wannan 3671* *et al.* (BRI); Beening Creek, Weipa, Jul 1984, *Gunness AG1870* (CNS); *c.* 26 km SSW of Aurukun & 3 km W of Archer River, Oct 1982, *Clarkson 4550* (BRI, CNS); 48 km ESE of Aurukun, Yuukingga Nature Refuge, May 2016, *Wannan 6784* & *Mitchell* (BRI); Road to Pormpuraaw, Jun 2008, *Wannan 5240* & *Graham* (BRI, NSW); Eight Mile Creek, Dixie Station, Aug 2008, *McDonald KRM7849* & *Wannan* (BRI); Harkness



Fig. 15. *Lindernia beasleyi*. Transverse stem section, *c.* $\times 65$ (Wannan 5896, BRI). Photo: B.S. Wannan.

Station, Cape York Peninsula, Jul 2008, Wannan 5334 & McDonald (BRI); Rock Hole near Emu Lagoon, Errk Oygangand NP, Jun 2010, McDonald KRM9288 & Cockburn (BRI); W of Almaden near race track, Jul 2010, Wannan 5896 & Spena (CNS); Near Almaden Racecourse, Oct 2010, Wannan 5944 & Beasley (BRI, CNS, NSW); Mud Soak Spring, Mt Surprise, Jun 2001, Fensham 4521 (BRI).

Distribution and habitat: *Lindernia beasleyi* is endemic to Queensland where it occurs from Cape York to south-west Cape York Peninsula (Map 2). It grows in moist sandy areas in wetlands and woodlands.

Notes: The novelty of this taxon is corroborated by sequence data (Wannan *et al.* unpubl.). It is perhaps most likely to be confused with *Lindernia subulata* that occurs over a similar distribution range, but differs in a range of characters as outlined above.

Conservation status: This species has a broad range and is moderately common in appropriate habitats. A status of **Least Concern** is recommended (IUCN 2001).

Etymology: The species is named for the late John Beasley whose handbooks provided accessible information on North Queensland plants.

***Lindernia barkeri* Wannan sp. nov.** Similar to *L. cleistandra* W.R.Barker but differs in its more erect glabrous habit with uncrowded leaves, shorter petioles (0.5–4 mm versus 5–22 mm), entire glabrous leaves, shorter calyx (1.5–3 mm versus 2–7 mm), much shorter corolla (4.5–6 mm versus 8–18 mm), and smaller capsule (1.5–3 mm versus 3.5–5.5 mm). **Typus:** Western Australia. KIMBERLEY: Garimbu Creek, 24 June 2014, B.S. Wannan 6687, M. Wardrop, P. Lane & H. Hofman (holo: PERTH; iso: BRI, CNS).

Lindernia sp. A W.R. Barker; (Barker 1992a: 828, Fig. 254E).

Annual herb; stems erect, 4–16 cm high, sometimes rooting at lower nodes, glabrous, green or rarely reddish. **Leaves** cauline, opposite, simple, glabrous; blade broadly lanceolate to depressed ovate, 3–20 \times 2.5–21 mm, diminishing in size up the stem, with 3–5 longitudinal veins; rounded to attenuate at base; margins entire, sinuate or rarely serrate; petiole 0.5–4 mm long. **Flowers** rarely axillary, mostly in racemes with triangular bracts 1–3.5 mm long; racemes sometimes with alternate bracts or when opposite with a single flower per node; pedicels erect 4–12 mm long, glabrous. **Calyx** deeply 5-lobed, almost to the base, triangular-ovate, lobes 1.5–3 mm long, acuminate, 1 or 3 nerved, with minute eglandular hairs. **Corolla** 4.5–6 mm long, white or mauve or pink; tube 2–4 mm long, externally with stalked glandular trichomes; upper lip porrect, *c.* 0.5 mm long, truncate, internally with longitudinal flaps enclosing the upper anther filaments; lower lip 3-lobed, 1.5–3 mm long, mid-lobe longer than lateral lobes, with the two laterals held at right angles to the mid lobe. **Upper stamens** 2, each with 2-cells, enclosed by the corolla flaps; filaments 0.8–1 mm long; anthers cohering, *c.* 0.5 mm long, the cells divergent. **Lower stamens** sterile represented by two short (*c.* 0.5 mm long) staminodes that are either linear or slightly clavate at the apex. **Ovary** *c.* 1.5 mm long, glabrous; style *c.* 2.5 mm long, glabrous. **Fruit** with pedicels to 25 mm long, calyx 1.5–3 mm long, capsule 1.5–3 mm long. **Seeds** cuboidal, *c.* 0.35 \times 0.25 mm with 4 longitudinal angles

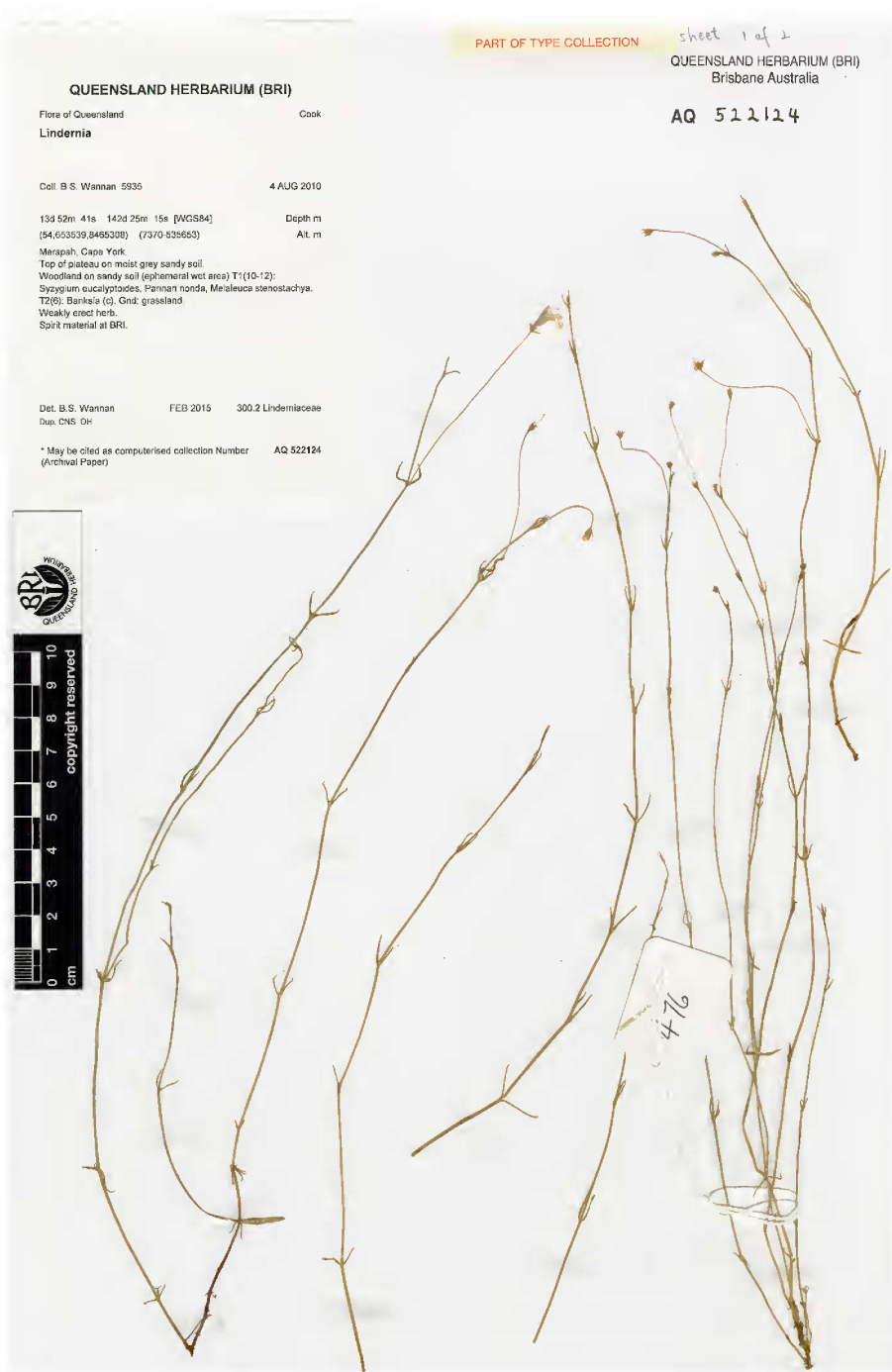


Fig. 16. Holotype of *Lindernia beasleyi* (Wannan 5935, BRI), sheet 1 of 2. Photo: W. Smith.



Fig. 17. Holotype of *Lindernia beasleyi* (Wannan 5935, BRI), sheet 2 of 2. Photo: W. Smith.

and transverse ridges, light brown. **Stem anatomy** in transverse section four-angled with collenchyma bundles in each corner, with separated vascular bundles; air spaces uncommon in outer cortex. **Figs. 18–25.**

Additional selected specimens examined: **Western Australia.** **KIMBERLEY:** Mt Hart Station, Jun 2002, *Wannan 2476* (BRI, PERTH); Tributary of Garimbu Creek, Jun 2014, *Wannan 6681 et al.* (CNS, NSW, PERTH); Gorge in Garimbu Creek, Jun 2014, *Wannan 6686 et al.* (CNS); tributary of Roe River, Jun 2014, *Wannan 6688 et al.* (CNS, PERTH); c. 1 km upstream of King Cascade, Prince Regent River, Feb 1999, *Barrett 715 & 716* (PERTH); c. 1 km E of falls at head of N arm of Bachsten Creek, Jan 1999, *Barrett 678* (PERTH); Upper Prince Regent River, 3.5 km E of Mt Agnes, Feb 2001, *Barrett 1044* (PERTH); Cypress Valley, beside Morgan River, S of New Theda Homestead, Jan 2001, *Barrett 1113* (PERTH); Breakfast Creek flowing S into Charnley River, Jun 1993, *Edinger 843* (PERTH).

Distribution and habitat: *Lindernia barkeri* occurs in the Kimberley of Western Australia (**Map 3**) and grows in wet sandy soil under sandstone overhangs or in the drip lines of cliffs, often in association with *Stylidium muscicola* F.Muell.

Notes: The novelty of this taxon, first proposed by Barker (1992a), is corroborated by its sequence data (Wannan *et al.* unpubl.) and although its leaf shape is similar to *Lindernia cleistandra* it differs from that species in many characters as outlined above.

Conservation status: This species has a broad, relatively undisturbed range but remains infrequently collected due to its remote habitat and wet-season phenology. A status of **Least Concern** is recommended (IUCN 2001).

Etymology: The species is named for W.R. (Bill) Barker who has worked on Australian *Lindernia* for over 30 years.



Fig. 18. *Lindernia barkeri*. Face view of flower, c. $\times 6$ (*Barrett 1113*, PERTH). Photo: M. Barrett.



Fig. 19. *Lindernia barkeri*. Habit with flowers, c. $\times 1$ (*Wannan 6687 et al.*, CNS). Photo: B.S. Wannan.

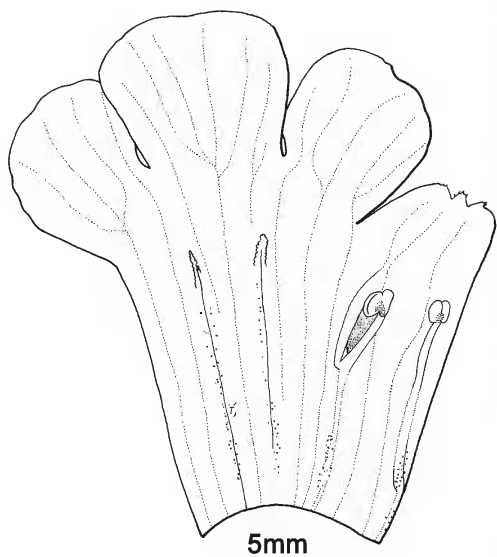


Fig. 20. *Lindernia barkeri*. Corolla opened to show stamens (Wannan 2476, CNS). Del. W. Smith.



Fig. 21. *Lindernia barkeri*. Leaf, c. $\times 3$ (Wannan 6681 et al., CNS). Photo: B.S. Wannan.



Fig. 22. *Lindernia barkeri*. Capsules, c. $\times 5$ (Wannan 6681 et al., CNS). Photo: B.S. Wannan.

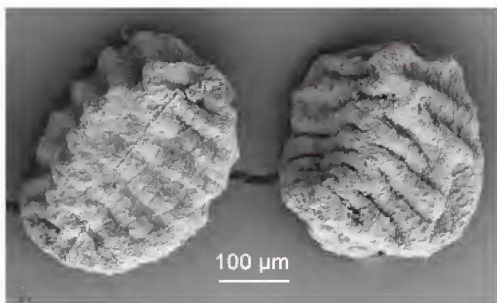


Fig. 23. *Lindernia barkeri*. SEM of seeds (Wannan 2476, CNS). Photo: Australian Museum.

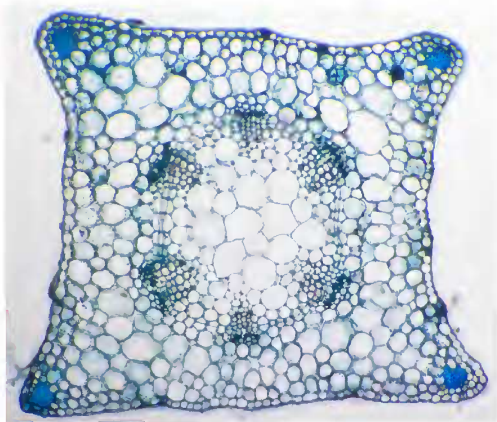


Fig. 24. *Lindernia barkeri*. Transverse stem section, c. $\times 70$ (Wannan 6687 et al., CNS). Photo: B.S. Wannan.



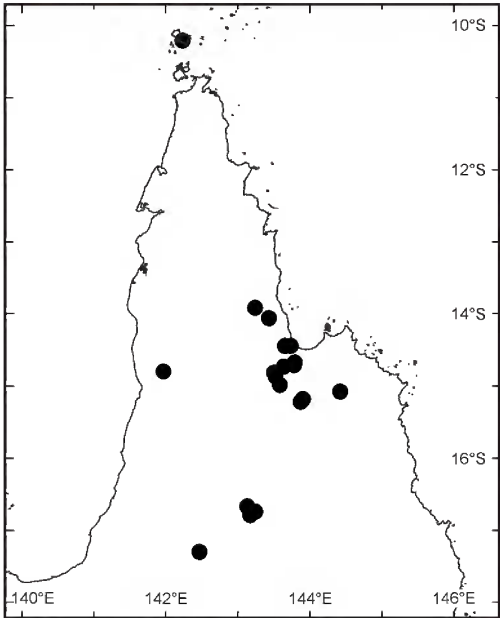
Fig. 25. Holotype of *Lindernia barkeri* (Wannan 6687 *et al.*, PERTH). Photo: F. Zich.

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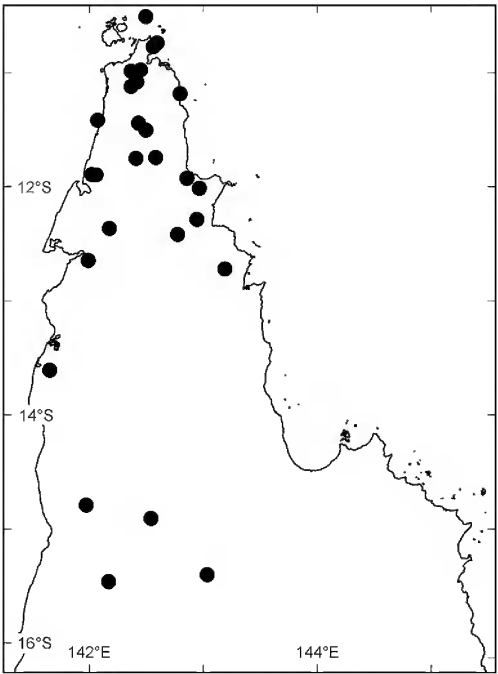
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References

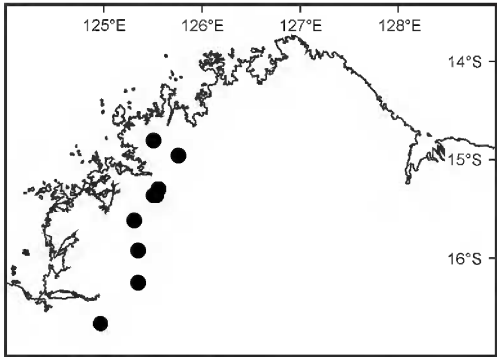
- BAILEY, F.M. (1901). *The Queensland Flora* 4: 1110–1112. H.J. Diddams: Brisbane.
- BARKER, W.R. (1990). New taxa, names and combinations in *Lindernia*, *Peplidium*, *Stemodia* and *Striga* (Scrophulariaceae) mainly of the Kimberley Region, Western Australia. *Journal of the Adelaide Botanic Gardens* 13: 79–93.
- (1992a). Scrophulariaceae. In J.R. Wheeler *et al.* (eds.), *Flora of the Kimberley Region*. Western Australian Herbarium, Department of Conservation and Land Management: Como.
- (1992b). *Lindernia*. In G.J. Harden (ed.), *Flora of New South Wales* 3: 564–565. New South Wales University Press: Kensington.
- (1998). A new species *Lindernia cowiei* and the variability of *L. tenuifolia* (Subg. *Bonnaya*: Scrophulariaceae) in Northern Australia. *Journal of the Adelaide Botanic Gardens* 18: 161–165.
- BENTHAM, G. (1868). *Flora Australiensis* 4: 495–499. L. Reeve & Co.: London.
- BROWN, R. (1810). [1960 facsimile]. *Prodromus Florae Novae Hollandiae et Insulae Van Diemen*. J. Cramer: New York.
- COWIE, I.D., SHORT, P.S. & OSTERKAMP MADSEN, M. (2000). *Floodplain Flora – A flora of the coastal floodplains of the Northern Territory, Australia*. Australian Biological Resources Study/Parks and Wildlife Commission of the Northern Territory: Canberra/Darwin.
- EWART, A.J. & DAVIES, O.B. (1917). *The Flora of the Northern Territory*. McCarron & Bird: Melbourne.
- FECHNER, N. (2007). Scrophulariaceae. In P.D. Bostock & A.E. Holland (eds.), *Census of the Queensland Flora 2007*. Queensland Herbarium, Environmental Protection Agency: Brisbane.
- (2014). Linderniaceae. In P.D. Bostock & A.E. Holland (eds.), *Introduction to the Census of the Queensland Flora 2014*. Queensland Department of Science, Information Technology, Innovation and the Arts: Brisbane.
- FISCHER, E., SCHÄFERHOFF, B. & MÜLLER, K. (2013). The phylogeny of *Linderniaceae* – The new genus *Linderniella*, and new combinations within *Bonnaya*, *Craterostigma*, *Lindernia*, *Micranthemum*, *Torenia* and *Vandellia*. *Willdenowia* 43: 209–238.
- IUCN (2001). *IUCN Red List of Categories and Criteria: Version 3.1*. IUCN Species Survival Commission: Gland/ Cambridge.
- LIANG, Y. & WANG, J. (2014). A systematic study of *Bonnaya* section *Bonnaya* (Linderniaceae). *Australian Systematic Botany* 27: 180–198.
- PHILCOX, D. (1968). Revision of the Malesian species of *Lindernia* All. (Scrophulariaceae). *Kew Bulletin* 22: 1–72.
- STANLEY, T.D. & ROSS, E.M. (1986). *Flora of South-eastern Queensland* 2: 438–441. Department of Primary Industry: Brisbane.
- WANNAN, B.S. (2013). New records for Queensland in *Lindernia* All. (Linderniaceae). *Austrobaileya* 9: 126–129.



Map 1. Distribution of *Lindernia stantonii*.



Map 2. Distribution of *Lindernia beasleyi*.



Map 3. Distribution of *Lindernia barkeri*.